STRATEGIES FOR COLLECTING RECREATIONAL OYSTER HARVEST DATA

BEN DYAR
SCDNR

February 3, 2019

Background

Oysters are a keystone species and are a vital part of South Carolina's estuaries and large coastal ecosystem. South Carolina contains 2,876 miles of tidal shoreline and 504,450 acres of salt marsh (representing 20 percent of the East Coast total). Oyster reefs provide many valuable ecological services to these coastal ecosystems. They supply a 3-dimensional habitat for 140 different fish and invertebrate species which utilize the reefs for shelter as well as feeding grounds. Oysters are filter feeders and help keep the water clean by filtering mass quantities of water, one adult oyster can filter up to 50 gallons per day. Oysters also protect and stabilize shorelines from erosion created by boats, tides and storms. In protecting and enhancing the state's saltmarshes and coastal ecosystem oysters aid in supporting future fisheries and tourism along our coast as well as being a culturally and economically important food source.

South Carolina's 4,985 acres of intertidal shellfish grounds are comprised of culture permit areas (commercial harvest only), state shellfish grounds (opened for both commercial and recreational harvesting or common grounds), public shellfish grounds (recreational harvest only) and King's Grant areas (privately owned). The 2,200 acres of designated State Shellfish Grounds (SSGs) and Public Shellfish Grounds (PSGs), both of which are available for recreational harvesting, are an important economic and ecological resource for the state. The long-term viability, sustainability and economic productivity of these grounds is dependent on properly informed, sound management. It is the South Carolina Department of Natural Resources' (SCDNR) duty to serve as the principal advocate for and steward of South Carolina's natural

resources. Proper sustainable management of these resources is impossible without usable data.

Problem Statement

Currently SCDNR does not have a way to accurately identify the number of recreational shellfish harvesters nor the number of bushels harvested recreationally on an annual basis. This data is necessary to calculate the amount of effort and related pressure that is being put on our oyster resources from the recreational harvesting community. This is especially critical when dealing with common grounds where both commercial and recreational harvesting occurs, such as SSGs, where there is a need to distinguish between commercial pressure versus recreational pressure. It is critical for managers of the state's public oyster grounds to develop an accurate and cost prohibitive method or tool for SCDNR to calculate the annual number of recreational oyster shellfish harvesters, the number of bushels of oysters recreationally harvested as well as the effort it takes to harvest.

Data Collection

Goals for data collection have several components including the ability to quantitatively identify the need for a better data collection method that allows for calculating catch per unit effort (CPUE) and recreational harvest pressure and where the shortfalls exists. SCDNR has conducted various surveys either by mail or electronic mail as well as contracted third-party phone surveys, all directly aimed at persons that possess a saltwater fishing license, which is necessary to recreationally harvest oysters. The third-party phone surveys were conducted by Responsive Management, a well-known and respected public opinion survey research firm specializing in natural resource, wildlife, environmental, and outdoor recreation issues

(Responsive Management Website. responsivemanagement.com/). SCDNR also conducted creel surveys at public boat landings throughout the state targeting anglers returning from harvesting. The survey data will be paired with saltwater recreational license sales data that has been recorded and put into an internal database by SCDNR statistics.

Secondly, it is important to understand and be aware of all the possible tools and methods currently in use to gather data for other recreationally managed species and their success rates. Data will be gathered by looking at other fisheries within South Carolina and other states and speaking with managers of these fisheries as well as the statistics department which compiles said data.

Cost of implementation of any outcome to the public or the agency, no matter the method, is a critical component in determining viability. Interviews with SCDNR licensing office, statistics, and outreach sections will be used as well as neighboring states websites for various license fees.

Data Analysis

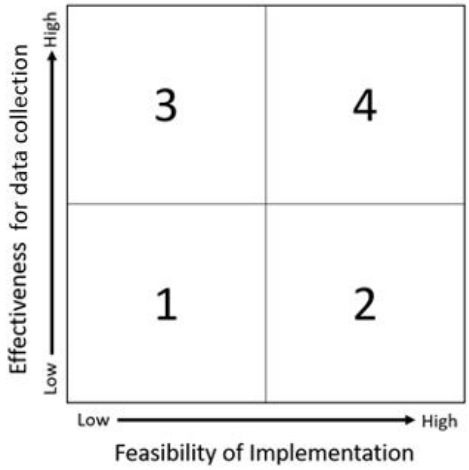
The most recent phone surveys performed by Responsive Management were conducted in 2016, 2008 and 2006. Focusing on marine anglers possessing a residential license who had harvested in the last 12 months prior. The surveys reported a 95% confidence rating with an average sampling error +/- 3.83%. The surveys did a decent job recording the number of individuals who participated in harvesting oysters, although it is still a percentage of the total that must be extrapolated out. Some surveys did not capture the average bushels harvested per trip and others failed to capture mean number of days harvested which led to the need to use assumptions to get comparable final figures. These assumptions decrease the confidence

in these surveys considerably. The resident license holders that were sampled included; annual resident license, 3-year resident license and 14-day resident license. It did not however sample Gratis license holders, a free lifetime license for individuals over 64 years of age, nor did they survey out of state license holders both of which presumably harvest oysters within South Carolina at some rate that of which is unknown. Nevertheless, these surveys remain the best record we have of getting at an estimated number of bushels being harvested recreationally. The data shows a range of 53,909 to 123,404 bushels potentially harvested recreationally in one year. This indicates the recreational harvest could be 60%-200% higher than previously thought. Speaking with previous resource managers I could only find anecdotal data for the current estimated recreational harvest set at around 30,000 bushels annually (Hadley, interview). This is important due to the previously held assumption that recreational numbers are lower than the commercial harvest and therefore less of a concern. The new data indicates that this is untrue and on the conservative side the estimated recreational harvest could be equal to or higher than the commercial harvest on SSGs and on the progressive side could be higher than all the commercial harvest combined annually (Appendix fig A – B Whitaker pg. 23). Backing up the idea of a more elevated recreational harvest than currently thought is the 1981 Saltwater Recreational License mail survey. In this survey it states that the recreational oyster harvest was over 200,000 bushels in 1981. Although there are major breaks in the data there is enough evidence, especially in the 2008 survey, indicating there is a higher recreational harvest pressure than previously thought and how much of an increase needs to be determined. The surveys also indicate where there are data gaps giving us detail on the variables that are necessary to accurately calculate recreational harvest numbers and pressure. These variables

include, 1) the number of recreational harvesters,2) the number of trips taken annually, 3) the number of bushels harvested per trip and 4) the length of time harvesting per trip or the length of time it takes to harvest desired amount.

Knowing that there are large data gaps in the information we are using to make resource management decisions it is necessary to investigate other tools or methods to gather data for these purposes. We will look at several different tools currently in use in other fisheries by either SCDNR or other resource management agencies for harvest and stock assessment data collection. These tools fall under two separate methodologies, voluntary and mandatory reporting. Methods/tools will be prioritized based on a ranking scheme that considers the effectiveness of the tool to gather the necessary variables and the feasibility of implementing the tool including associated costs. Figure 1 illustrates the 2x2 matrix ranking scheme.

Fig 1



Method 1: Voluntary Reporting

Recreational fisheries voluntary reporting offers a few different tools to gather harvest data. These tools are typically used in conjunction with other data sources to calculate harvest pressure and stock assessments. Recreational angler self-reporting is a citizen-science based approach that in recent years has manifested to using cell phone apps to collect recreational angling data directly from the harvester in the field (Garvey, pg. 1). The South Atlantic Fisheries Management Council (SAFMC) responsible for the conservation and management of fish stocks

within the federal 200-mile limit of the South Atlantic has a phone app called myfishcount.com that allows anglers to report their catch into the SAFMC database (SAFMC website, samfc.net). This app is not currently set up to log or record harvest of oysters. Even if there was a way to add oysters as a species and the type of harvest method to the app there are still doubts to the level of accuracy for this type of data collection. Results indicate that angler self-reporting currently suffers from low user engagement and statistical bias in self-reported data (Garvey, pg. 4). Not knowing the total pool of recreational harvesters, the ability to extrapolate total amount harvested or harvest pressure would be impossible. I am rating app-based self - reporting a 1 for low effectiveness and low feasibility of implementation due to the need to implement and pay for a robust marketing and outreach campaign to recruit angler feedback.

Another voluntary based reporting tool is utilizing phone, mail or electronic mail surveys. The surveys are aimed at a known set of users and survey a subset of those users. These surveys are a tool SCDNR has used in the past and as previously mentioned has its limitations. However, by noting the data gaps in past surveys better questions could be used and therefore DNR could receive a fuller data set. The problem still arises in getting a usable estimate on harvest pressure by not having a known number of recreational oyster harvesters. The surveys are aimed at all SC residents that have a registered saltwater recreational fishing license. The surveys by default can only give a percentage estimate of how many license holders are utilizing their license for oyster harvesting. Costs associated with contracted surveys are considerable. Invoices from past SCDNR surveys contracted out to Responsive Management show costs of approximately $30,000. Limits in the current and foreseeable budget would not allow for an annual survey of this type. I am rating phone and mail survey-

based reports a 1 for low effectiveness as a standalone method for gathering all the necessary data and low feasibility of implementation due to the associated cost. Although mail surveys ranked low effectiveness, once an accurate number of harvesters is known they would be useful in filling some data gaps by asking the proper questions.

A third tool under voluntary reporting would be creel surveys. Just like with phone or mail surveys these would be actively seeking out the user to ask fishery harvest questions unlike the web app self-reporting. Creel surveys are conducted by SCDNR biologists targeting recreational anglers and harvesters at public boat landings after they have come back with their catch. If the anglers are willing the biologist will ask them questions to gather the appropriate data. Much of the funding for SCDNR's creel survey program comes from the National Oceanic and Atmospheric Association (NOAA) and its Marine Recreational Information Program (MRIP) (Floyd, personal interview). The data is funneled through the SAFMC and is recorded onto a standardized data sheet. This federal program does not account for oyster harvesting. The decision to change or add to the data to be requested is on a federal level and any change would need to be implemented by all participating states making it difficult to alter this process (Floyd, personal interview). The MRIP creel surveys are conducted February through November in South Carolina. This leaves December and January for state-based creel surveys. Since 2017 SCDNR has created a creel survey specifically aimed at recreational oyster harvesters. This gives us the ability to get ancillary data that we are not able to acquire with other surveys such as location of specific harvest grounds and average bushel per trip. It also gives us the ability to ground truth the data since the creel clerks are at the landing verifying the harvesters catch. Currently SCDNR does not have state funding available to run the oyster creel survey 12 months

out of the year. Even so there is again the inability of this method to get an accurate count of the number of recreational license holder that harvest oysters. I am rating creel surveys a 2 for low effectiveness for overall data needs and high feasibility of implementation since we currently conduct these surveys. Although creel surveys are not able to gather all the necessary data alone they can be an added tool for getting useful supplemental data and could be used in conjunction with other methods/tools.

Method 2: Mandatory Reporting

Mandatory reporting for gathering recreational harvest/catch data usually requires legal authority through statute or regulation since it is requiring the public to give information to the government and is usually associated with a required license to take or possess a recreationally managed species. Mandatory reporting for recreational fisheries is typically gathered at the point of sale when purchasing a license. Since the $10 South Carolina saltwater recreational fishing license already must be purchased to engage in the harvesting of oysters it is not necessary to create a new license solely for that purpose. Endorsements or tags used in association with a fishing or hunting license are used by many states as well as South Carolina to authorize the taking of a specific species associated with a broader license. One example would be to hunt deer in South Carolina you would need a $12 state hunting license, a $6 big game permit as well as deer tags at no cost. According to the SCDNR recreational permitting website South Carolina has several examples of endorsements and tags from deer tags and turkey tags to gill net endorsement for fishing with that gear type (website SCDNR special tags, dnr.sc.gov/regs/pdf/speciallicenseapp.pdf). Requiring an additional endorsement for a specific species instantly and accurately identifies a known number of persons engaging in that specific

activity. There is still some error due to the public requesting an endorsement or tag and not harvesting/taking associated species from the wild, but this error is viewed as acceptable for data purposes. One way to combat the false positives arising from persons requesting and not using an endorsement would be to have a fee associated with the endorsement requiring a more deliberate decision and making it less likely someone would request one "just in case" they want to use it. Most of the endorsements on the SCDNR permitting website come with a nominal fee averaging $5.

When the public is requesting their endorsement there is an opportunity to gather additional data. There is a precedence in requiring the public to answer specific questions in order to complete the process of obtaining their endorsement or license as seen in fig 2.

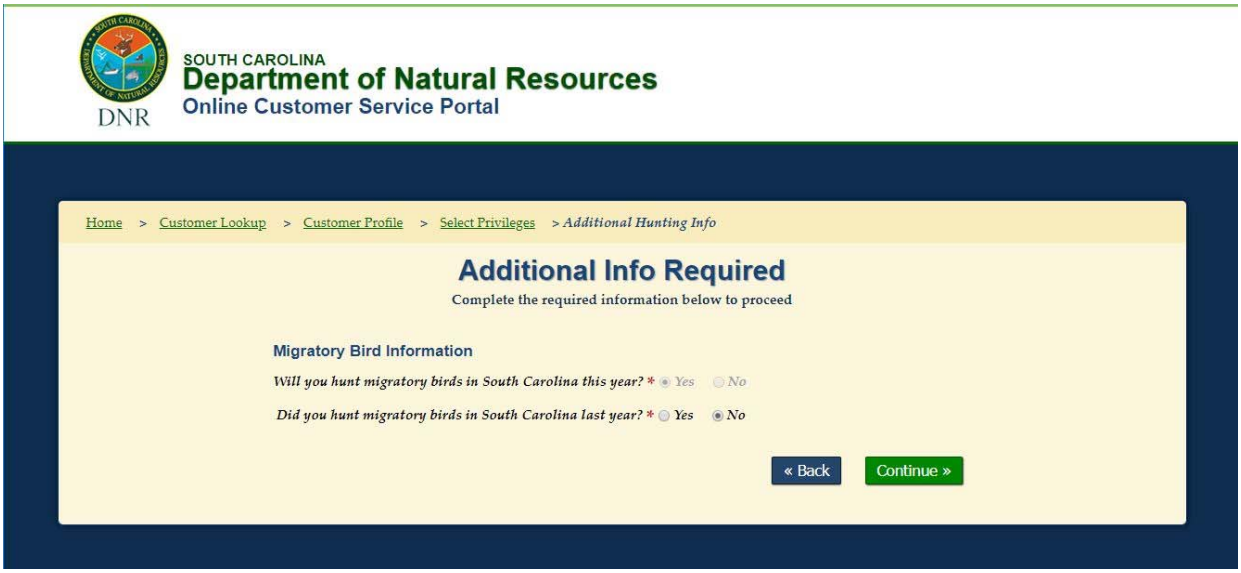


Fig 2.

One such example is the South Carolina Migratory Bird Permit which is a program funded by the Federal Duck Stamp. The Migratory Bird Harvest Information Program (HIP) is a method the state wildlife agency and the U.S. Fish and Wildlife Service (USFWS) use to generate reliable estimates of hunting activity and the number of all migratory game birds harvested throughout

the country (USFWS website, fws.gov). This is a no cost endorsement in South Carolina and requires a $12 hunting license.

Since any endorsement for harvesting oysters in South Carolina would require legislative action preliminary data was presented to SCDNR upper management to determine the feasibility of implementation. A format exists for presenting legislative changes regarding the management of recreational and commercial fisheries. It is important to get as much buy-in as possible from appropriate stakeholders including advisory and oversight committees. In this case ideas are first presented to the Marine Advisory Council (MAC) and then the SCDNR Board along with the SCDNR Directors approval before moving past SCDNR and being taken up in the legislation. This process is arduous but not impossible and new legislation is passed regularly in South Carolina regarding natural resource management.

Two options arise for a potential oyster shell harvesting endorsement. One is a low fee endorsement. I am rating a low fee endorsement a 3 for high effectiveness for data collection and low feasibility of implementation due to the fee associated with the endorsement causing the unlikelihood of getting it past the MAC and SCDNR board. Inversely the other option is a no cost endorsement. A no cost endorsement I am rating a 4 for high effectiveness and high feasibility of implementation. Even without an associated fee there is a continued level of high effectiveness since there is still a separate step. The public wishing to receive the endorsement would need to actively choose the endorsement separately from purchasing a fishing license and answer the required questions. Although difficulties exist in passing legislation a no cost endorsement has a much higher chance of being endorsed by the Counsel, Board and administration, according to SCDNR upper management. It is important to note that there are

negligible costs to the department associated with the proposed endorsements (Jarrett, personal interview). Adding another endorsement to the point of sale process could be accomplished by SCDNR IT adding another line to the online form and for in person sales adding just another line and check box on the printed endorsement page list. Regarding the printed license for the harvester to carry, there would not be a need to print a separate endorsement license since a saltwater fishing license is already required. The endorsement would be just

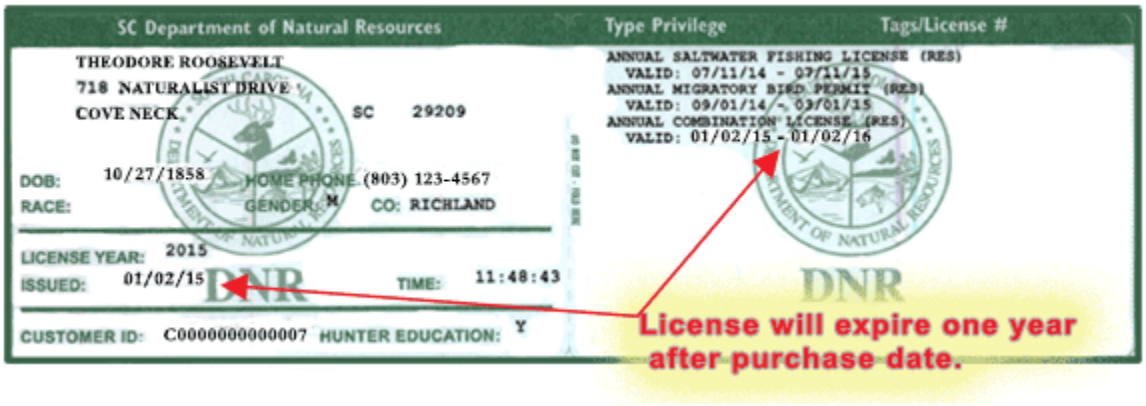


Fig 3. Sample recreational fishing license.

another line printed on the paper copy of the saltwater fishing license received from the department as seen on the right side of fig 3.

Comprehensive Ranking of available tools.

Method	Tool	Ranking
Voluntary	Self-based with web app	1*
Voluntary	Phone/mail survey	1*
Voluntary	Creel Survey	2*
Mandatory	Low cost endorsement	3
Mandatory	No cost endorsement	4

*Rankings are based on the tools ability to gather all the necessary data as a standalone method. The rankings of some tools would change if used in combination.

Implementation

Based on the data collected the most useful and accurate tool to calculate harvest pressure and CPUE would be a no cost endorsement. As mentioned, an endorsement will require legislative action. The Shellfish Management Section (SMS) for SCDNR will write a

justification summary for the endorsement based on this report as well as a detailed description of how the endorsement should be implemented. This should include how the endorsement will be selected for the different types of point of sale including, counter sales at registered vendors, SCDNR offices and online. The proof of endorsement, once requested, can be added to the original fishing license as shown in this report. Cost associated with implementing the endorsement would be based on personnel time. Cost associated with managing and distributing the endorsements once implemented would be negligible as shown. Steps for receiving this endorsement will also include questions to be asked. Suggested questions would include; Did you harvest oyster last year? How many times/trips did you harvest oysters last year? How many bushels did you harvest per trip on average? How many persons with a recreational oyster harvest endorsement were in your group/boat when harvesting on average? On average how long did it take you to harvest? SMS will finalize the justification and detailed implementation by working closely with SCDNR Office of Fisheries Management and Marine Resource Division upper management. Once finalized presentations outlining these findings and implementation plans to stakeholder groups, such as the MAC, SCDNR Board as well as special interest groups, will be necessary. If no objections arise the management strategy of an endorsement for oyster harvesting will be presented to legislation. It will be in the interest of the Department to gain the buy-in of special interest groups, such as the Coastal Conservation Association (CCA), to help lobby the endorsement as it makes its way through the legislation. At this point it is in the hands of the legislative process.

While this lengthy process is taking place, it is suggested that phone and electronic mail surveys be utilized along with creel surveys. Although the data would not be as

accurate as that gathered from an endorsement it still can provide resource managers with enough data to show any drastic decline in the fishery albeit after the fact. This option is better than no data at all. Questions asked by the surveys can be improved upon and therefore fine tune the data output. The surveys conducted by Responsive Management would be the first choice as they have a known calculated error rating but due to the high cost it may be necessary for SCDNR to do an in-house email survey.

Creel surveys should continue to be conducted no matter the other tools selected. The creel surveys are already ongoing and budgeted. SCDNR has control over questions that can be asked and they have an added benefit of ground truthing the data by having the biologist in the field at the point of contact. Again, creel surveys would not suffice by themselves but are a great tool to acquire data that would otherwise not be obtained from other methods such as showing the harvester a map and asking which grounds they harvested from.

Evaluation

Results from the requests for the recreational oyster harvesting endorsement as well as answers to the associated questions will go directly into an internal SCDNR permitting database. This database, VOLTS, can be queried to extract desired data. Data received from Responsive Management or SCDNR Outreach Section phone or email surveys are part of the survey package and are already broken down and graphed into usable data sets when received from each source. Data collected from creel surveys conducted by SCDNR is entered into a database maintained by the MRD statistics department. Data queries can be requested, and reports compiled by the statistics department.

Summary

Currently SCDNR does not directly manage for or consider the impacts of the individuals harvesting oysters recreationally. Preliminary data shows that these impacts could be as much or more than the commercial harvest. Heavily harvested areas and environmental perturbations are the greatest threat to oysters in South Carolina, but could be mitigated through proper management (Walker, pg 1). SCDNR cannot properly manage its oyster populations without accurate data leaving those populations susceptible to being unknowingly overharvested. “You can’t manage what you can’t measure” (Peter Drucker). A no cost endorsement of oyster harvesting in South Carolina would be a major and necessary step in the proper management of its oyster resources. It is recommended that the Shellfish Management Section working with Marine Resource Division upper management develop a detailed and justified plan for implementing such an endorsement. Importance should be placed on seeing this endorsement as a vital tool in keeping South Carolina’s oyster populations sustainable for future generations to enjoy.

Appendix

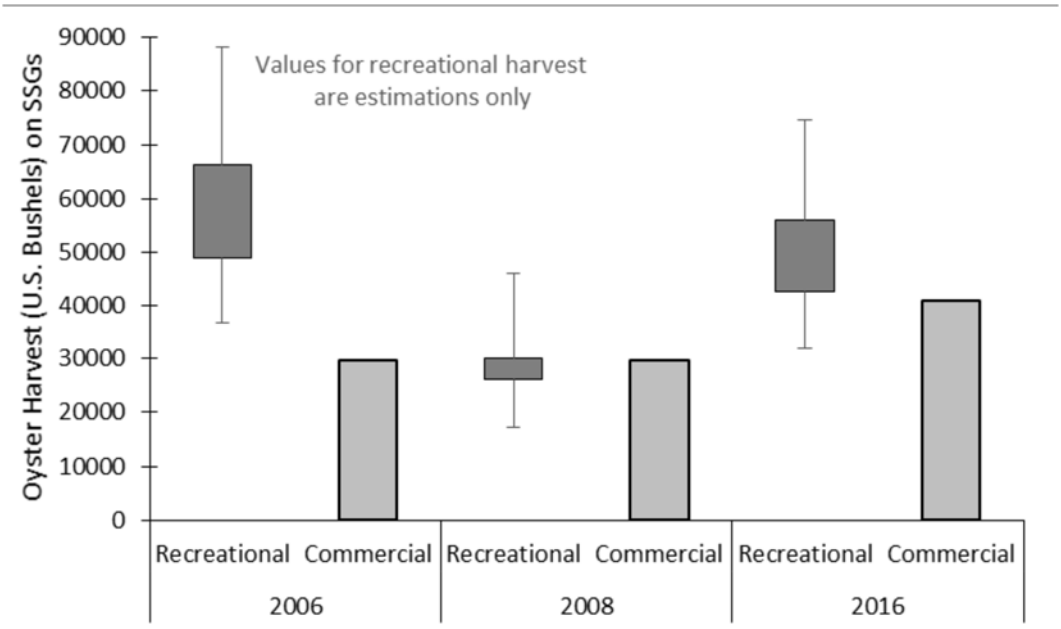


Fig A: Comparison of oyster harvest on SSGs by recreational (estimated; dark gray) and commercial (actual; light gray) harvesters. Estimated recreational harvest is based on responses of boat owners to saltwater fishing license surveys with similar methods conducted in 2006, 2008 and 2016. Estimates represent variability in both the number of bushels likely harvested per individual, and where individuals typically harvest (SSGs vs PSGs vs CPs). Boxes represent moderate estimates of harvest and error bars represent maximum and minimum possible harvest.

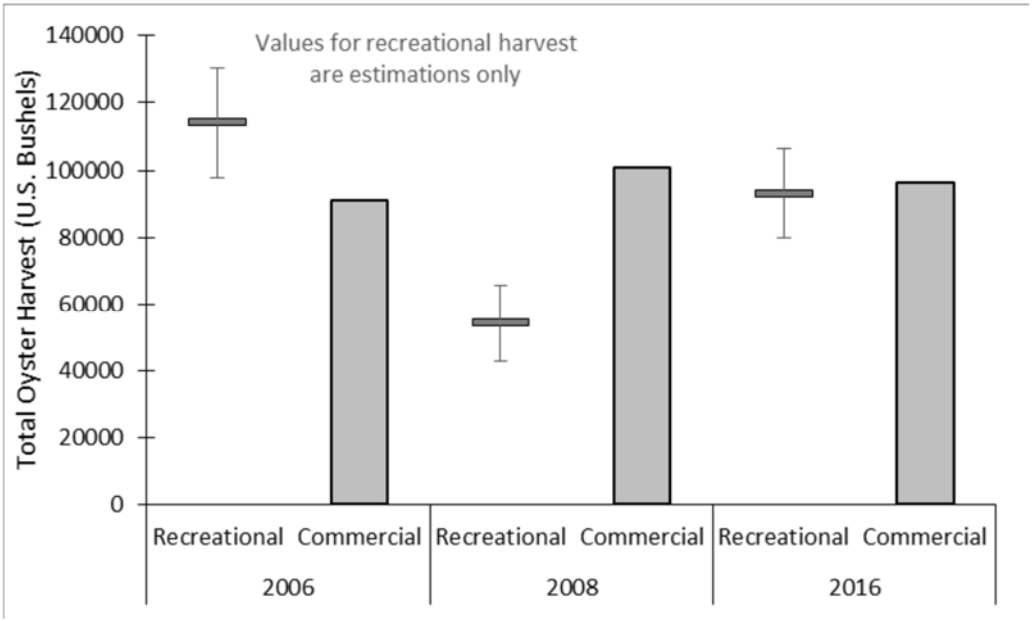


Fig B: Comparison of oyster harvest on SSGs by recreational (estimated; dark gray) and commercial (actual; light gray) harvesters. Estimated recreational harvest is based on responses of boat owners to saltwater fishing license surveys with similar methods conducted in 2006, 2008 and 2016. Estimates represent variability in both the number of bushels likely harvested per individual, and where individuals typically harvest (SSGs vs PSGs vs CPs). Boxes represent moderate estimates of harvest and error bars represent maximum and minimum possible harvest. Generally, oysters may be harvested recreationally on SSGs and PSGs and commercially on SSGs and CPs.

References

Duda, M. D. 2006, 2008, 2016. Responsive Management Surveys for SCDNR, South Carolina Saltwater Angler Participation

Floyd, B. SCDNR Biologist, Creel Survey Manager. Personal Interview, January 15, 2019

Garvey, K. 2015. The Emergence and Use of Angler Self-Reporting Apps in Recreational Fisheries.

Hadley, N. SCDNR Biologist, Head of Shellfish Management Section (retired). Personal Interview October 9, 2018

Jarrett, J. SCDNR Permitting Manager. Personal Interview January 17, 2019

Walker, R. J., Anderson, W. D., Moore, S. 2017. Evaluating South Carolina's Shellfish Management

Whitaker, D. SCDNR Assistant Director Marine Resource Division (retired). Personal interview October 10, 2018

Whitaker, D., Hadley, N., Mack, K. 2018. Trends in Oyster Harvest on SC State Shellfish Grounds.